

# District School Board of Niagara Energy Conservation and Demand Management Plan 2018/2019 – 2022/2023

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#### **Executive Summary**

The District School Board of Niagara's (DSBN) "Energy Conservation and Demand Management Plan 2018/2019 – 2022/2023" is written to meet the legislative requirements laid out by the Province of Ontario in O. Reg. 507/18: Broader Public Sensor: Energy Reporting and Conservation and Demand Management Plans. This report is the second 5-year term for energy conservation and demand management, the first of which is was created for the 2013/2014-2017/2018 period.

The DSBN remains committed to advance energy efficiency within our 104 facilities, and with the 3,000+ staff and 30,000+ students which utilize our facilities on a daily basis. As detailed in the report, the goal of the first 5-year term was a 5% reduction in weather-normalized energy utilization index (EUI) (ekWh/ft²) which was reached. In fact, the DSBN, through implementation of sector best practices and prudent fiscal management, was able to reach an 8.7% reduction in weather-normalized EUI. These energy savings also produced an annual cost avoidance for the DSBN of roughly \$305,000 in utility costs. Along with the approximately \$402,000 received in utility-provided incentives, energy management at the DSBN has produced nearly three-quarters of a million dollars in value. For the upcoming 5-year period, an additional reduction in weather-normalized EUI of 5% was selected as the goal. This was chosen to reflect the fact that processes are in the place to replicate the success of the previous 5 years at additional facilities, while striving to include additional projects to not only reduce energy use but improve the indoor learning environment for staff and students. These projects are summarized in the Appendices attached to this report.

The on-going completion of capital and operational projects to reduce energy use in DSBN's facilities will be guided by a philosophy of sustainability and natural resource conservation. This philosophy, combined with a focus on preventative maintenance and operations' best practices, will lead to continued utility cost savings, greenhouse gas reductions, and exceptional indoor learning environments.

#### **Education Sector Background**

#### **Funding and Energy Management Planning**

All school boards receive 100% of their funding from the Ministry of Education.

The Ministry announces each Board's funding assignment in the Spring for the next school board Fiscal Year (September 1<sup>st</sup> to August 31<sup>st</sup>). The Ministry gives funding only on a year-by-year basis.

While a board may have a five-year energy management strategy, the ability to implement their strategy depends on the funding that's received for each of the five years covered by their plan.

#### **Asset Portfolios and Energy Management Planning**

The education sector is unique in that a board's asset portfolio can experience important changes that crucially impact a board's energy consumption over a five-year period.

The following is a list of some of the most common variables and metrics that change in the education sector.

#### **Facility Variables:**

- Construction
  - Year built
  - Number of floors
  - Orientation of the building
- Building Area
  - Major additions
  - o Sites sold/closed/demolished/leased
  - Portables
    - Installed
    - Removed
  - Areas under construction
- Equipment/Systems
  - Age
  - Type of technology
  - o Lifecycle
  - Percentage of air-conditioned space

- Site Use
  - Elementary school
  - Secondary school
  - Administrative building
  - Maintenance/warehouse facility
  - Community Hubs
- Shared Site Use (For example: two or more boards share common areas and/or partnered with a municipality)
  - Swimming pools
  - Libraries
  - Lighted sports fields
  - Sports domes

#### Other Variables:

- Programs
  - Child care
  - Before/After School Programs
  - Summer School
  - Community Use
    - Outdoor ice rinks
- Occupancy
  - o Significant increase or decrease in number of students
  - o Significant increase in the hours of operation
  - o New programs being added to a site
- Air Conditioning
  - Significant increase in air-conditioned space
  - Portables

#### Part I: A Review of Progress & Achievements in the Past Five Years

#### A. The Board's Asset Portfolio

The following table outlines the energy-related variables and metrics in the Board's asset portfolio that changed from the baseline Fiscal Year 2012/2013 to the end of the five-year reporting period Fiscal Year 2017/2018.

Table 1: Board's Asset Portfolio

Key Metrics	Fiscal Year 2012/2013 (Baseline Year)	Fiscal Year 2017/2018	Variance
Total Number of Buildings	128	109	-19
Total Number of Portables/Portapaks	61	64	3
Total Floor Area (ft²)	6,365,683	6,152,220	-213,333
Average Operating Hours	61	61	-
Average Daily Enrolment	33,934	37,614	3,680

#### B. Energy Usage Data for the Board

The following table lists the "metered" consumption values in the common unit of Equivalent Kilowatt Hours (ekWh) and Kilowatt Hours (kWh).

**Table 2: Metered Usage Values** 

Utility	Fiscal Year 2012/2013 (Baseline year)	Fiscal Year 2017/2018
Total Electricity (kWh)	34,940,030	30,087,630
Total Natural Gas (ekWh)	87,630,860	80,600,400

<sup>1</sup> Metered consumption is the quantity of energy used and does not include a loss adjustment value (the quantity of energy lost in transmission).

Utility	Fiscal Year 2012/2013 (Baseline year)	Fiscal Year 2017/2018
Total Propane (ekWh)	42,345	179,560

#### C. Weather Normalized Energy Consumption Values

In Ontario, 25% to 35% of energy consumption for a facility is affected by weather.

To demonstrate the affect of weather, the following table shows the Weighted Average Heating Degree Days (HDD)<sup>2</sup> and Cooling Degree Days (CDD)<sup>3</sup> for the six most common Environment Canada weather stations in the Ontario education sector.

**Table 3: Ontario Degree-days** 

Ontario Degree Days	Fiscal Year 2012/2013	Fiscal Year 2013/2014	Fiscal Year 2014/2015	Fiscal Year 2015/2016	Fiscal Year 2016/2017	Fiscal Year 2017/2018
HDD	3698	4285	4091	3355	3583	3989
CDD	289	217	271	462	303	432

The best way to compare energy usage values from one year to another is to use weather normalized values as they take into consideration the impact of weather on energy performance and allows an "apple-to-apple" comparison of consumption across multiple years.

However, a straight comparison of Total Energy Consumed between one or more years does not take into consideration changes in a board's asset portfolio, such as changes in buildings' features (refer to the Facility Variables listed on pages 5 and 6), and newly implemented programs (refer to the Note to Readers on pages 10-12) which will greatly impact energy consumption.

<sup>&</sup>lt;sup>2</sup> Heating Degree Day (HDD) is a measure used to quantify the impact of cold weather on energy use. In the data above, HDD are the number of degrees that a day's average temperature is below 18C (the balance point), the temperature at which most buildings need to be heated.

<sup>3</sup> Cooling Degree Day (CDD) is a measure used to quantify the impact of hot weather on energy use. In the data above, CDD are the number of degrees that a day's average temperature is above 18C, the temperature at which most buildings need to be cooled. It should be noted that not all buildings have air conditioning and some building have partial air conditioning. The UCD only applies CDD to meters that demonstrate an increase in consumption due to air conditioning.

As a result, weather normalized Energy Intensity<sup>4</sup> is the most accurate measurement that allows the evaluation of a board's energy use from one year to another as it cancels out any change in floor area. The unit of measurement used is either equivalent kilowatt hours per square foot (ekWh/ft²) or equivalent kilowatt hours per square metre (ekWh/m²).

**Table 4: Weather Normalized Values** 

Weather Normalized Values	Fiscal Year 2012/2013 (Baseline Year)	Fiscal Year 2017/2018 (Most Recent Data Available)	
Total Energy Consumed (ekWh)	118,710,700	104,736,400	
Energy Intensity (ekWh/ft²)	18.65	17.02	
Energy Intensity (ekWh/m²)	200.7	183.3	

#### D. Review of Previous Energy Conservation Goals and Achievements

In 2014, the Board set annual energy conservation goals for the following five fiscal years. The following table compares the Energy Intensity Conservation Goal with the Actual Energy Intensity Reduced for each year. The DSBN's conservation goal as stated in the 2014 Conservation and Demand Management Plan was to reduce weather normalized energy intensity (ekWh/ft²) by 5% over five years. This goal is reflected in the Goal Percentage in Table 5 below.

<sup>4</sup> Energy Intensity (known as EI) is the quantity of total energy consumed divided by the total floor area. EI is typically expressed as equivalent kilowatt hours per square foot (ekWh/ft $^2$ ), gigajoule per square metre (GJ/m $^2$ ), etc., depending on the user's preference.

Table 5: Comparison of Energy Intensity Conservation Goal and Actual Energy Intensity

Reduced

Fiscal Year	Energy Intensity Conservation Goal (ekWh/ft²)	Energy Intensity Conservation Goal (ekWh/m²)	Conservation Goal Percentage	Actual Energy Intensity Reduction (ekWh/ft²)	Actual Energy Intensity Reduction (ekWh/m²)	Actual Energy Percentage
2013/ 2014	0.20	2.0	1.0	0.37	4.0	2.0
2014/ 2015	0.20	2.0	1.0	0.58	6.3	3.2
2015/ 2016	0.20	2.0	1.0	-0.92	-9.9	-5.2
2016/ 2017	0.20	2.0	1.0	0.75	8.1	4.0
2017/ 2018	0.20	2.0	1.0	0.84	9.0	4.7

#### **NOTE TO READERS:**

The Conservation Goals were forecasted in Spring 2014. Since then several factors, which impact energy use, have been introduced to the education sector that may either raise or limit a board's ability to make the forecasted Conservation Goals.

Some of these factors include:

#### Full Day Kindergarten (also known as FDK)

The introduction of FDK created many new spaces through new additions or major renovations of existing facilities. The result was more floor area and sometimes more energy-intensive designs due to factors such as:

- Higher ventilation requirements,
- Use of air conditioning, etc.

These factors increase the energy intensity of a building. Under FDK, spaces for more than 470,000 new students were added to the education sector.

#### **Before and After School Programs**

These programs were implemented to help the introduction of FDK spaces. However, Before-School and After-School Programs need a facility's Heating, Ventilation, and Air Conditioning (also known as HVAC) system to operate for an extended period of time on a daily basis, which will increase the overall energy intensity.

#### **Community Use of Schools**

The Ministry of Education introduced funding to all school boards, so they can make school space more affordable for use after school hours. Both indoor and outdoor school space is available to not-for-profit community groups at reduced rates, outside of regular school hours. The use of spaces in schools, typically gymnasiums and libraries, increased to maximum usage. The use of these spaces during non-school hours requires a facility's HVAC system to operate for an extended period of time on a daily basis, which will increase the overall energy intensity.

#### **Community Hubs**

In 2016, the Ministry of Education introduced funding for boards to carry out Community Hubs within their asset portfolios. As a result, many schools now offer a greater range of:

- events (cultural),
- programs (arts, recreation, childcare), and
- services (health, family resource centres).

The dramatic increase in community use means that many schools now run from 6:00 a.m. until 11:00 p.m. during weekdays and are open many times on weekends. The use of these spaces during non-school hours requires a facility's HVAC system to operate for an extended period of time on a daily basis, which will increase the overall energy intensity.

#### **Air Conditioning**

Historically, DSBN schools have not had air conditioning, or it has been a minimal space in the facility. However, with changing weather patterns, "shoulder seasons" such as May, June and September are experiencing higher than normal temperatures. Parents are consistently requesting that schools have air conditioning. Air conditioning significantly increases a facility's energy use.

#### Compliance with current Ontario Building Code (also known as OBC)

When renovations or an addition is built onto an existing school, in-place equipment such as HVAC systems, lighting etc., may be required to meet up-to-date OBC standards which may result in increased energy use.

For example, under the OBC, buildings built today have increased ventilation requirements, meaning more outside air is brought into a facility. As a result, HVAC systems need to work longer to heat or cool the outdoor air to bring it to the same temperature as the standard indoor temperature for the building.

#### E. <u>Cumulative Energy Conservation Goal</u>

The following table compares the 2014 Forecasted Cumulative Energy Intensity Conservation Goal with the Actual Cumulative Energy Intensity Reduced Savings.

Table 6: Cumulative Energy Intensity Goal from Fiscal Year 2013/2014 through Fiscal Year 2017/2018

Cumulative Energy Intensity	(ekWh/ft²)	(ekWh/m²)	Variance
Forecasted Cumulative Energy Intensity Conservation Goal of Fiscal Year 2013/2014 through Fiscal Year 2017/2018	1.00	10.0	
Forecasted Cumulative Energy Intensity Conservation Goal as a Percentage			5.0%
Actual Cumulative Energy Intensity Reduced or Increased from Fiscal Year 2013/2014 through Fiscal Year 2017/2018 – Weather Normalized	1.62	17.5	

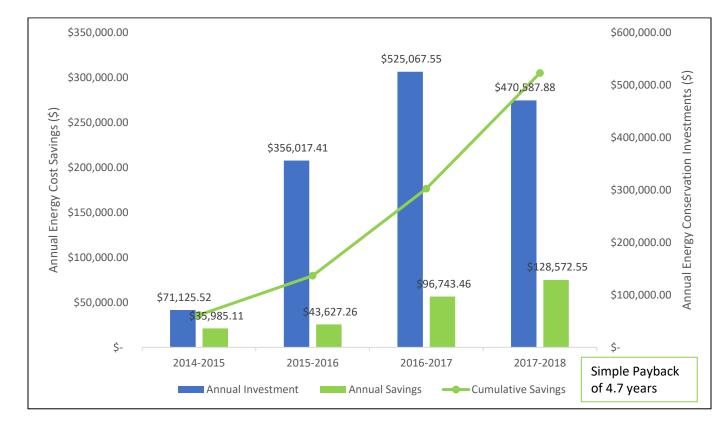
Cumulative Energy Intensity	(ekWh/ft²)	(ekWh/m²)	Variance
Variance between 2014 Forecast Cumulative Conservation Goal and Actual Cumulative Energy Intensity— Weather Normalized	0.62	7.5	
% of Cumulative Energy Intensity Conservation Goal Achieved - Weather Normalized			8.7%

#### F. Measures Implemented from Fiscal Year 2012/2013 to Fiscal Year 2017/2018

A list of the measures implemented, the related costs, and the fiscal year that the measure was implemented within the Board are outlined in **Appendix II: Investments in Energy**Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018. Here is the list of sheets:

- 1. Design, Construction and Retrofit Investments
- 2. Operations and Maintenance Investments
- 3. Occupant Behaviour Investments
- 4. Summary of All Investment Types

Additional measures were implemented by DSBN through activities targeted by the Energy Coordinator with the express purpose of addressing the board's energy conservation goal of a 5% reduction in energy intensity by 2018/2019. A list of these projects, their costs, energy savings, energy cost savings, and simple payback can be found in **Appendix III: DSBN Energy Conservation Measures – Fiscal Year 2014/2015 to Fiscal Year 2017/2018.** These measures are also summarized in the below graph. Also note, the Energy Coordinator was hired in September 2014, so no additional measures were implemented in the 2012/2013 and 2013/2014 fiscal years.



Graph 1: DSBN Energy Conservation Measures (2014/2015 - 2017/2018)

Some highlights of the achievements in energy efficiency from the 2012/2013 – 2017/2018 period include:

- 1) All Secondary School gymnasium lighting retrofitted to LED fixtures with occupancy control and manual dimming capabilities.
- 2) All interior lighting with a load greater than one hundred watts retrofitted to LED lamps or fixtures. This includes all Secondary School automotive, carpentry, etc. shops, cafeterias, and auditoriums.
- 3) Board-wide implementation of facility water consumption monitoring and leak detection.
- 4) Training for Maintenance and Operations staff on energy efficiency programs such as; low voltage lighting controls, portable classroom HVAC system design and efficient operation, and water end-use technologies and sustainability.
- Strategic resource management for the efficient purchase of natural gas and electricity commodities.
- Purchasing Department policy changes to prioritize Energy Star small appliance purchases.
- 7) Facilities Department specifications for heating systems to standardize condensing boilers.

# Part II: Energy Conservation and Demand Management Plan for Fiscal Year 2018/2019 to Fiscal Year 2022/2023

Part II outlines the board's plan to reduce energy consumption through energy management strategies including:

- 1. Design, Construction and Retrofit;
- 2. Operations and Maintenance; and lastly
- 3. Occupant Behavior.

#### **Background**

1. To date the Board's energy management strategy has included the following:

The DSBN has been guided by a philosophy centred on reducing the consumption of natural resources through energy efficiency programs, raising awareness, and strategic capital investments. While, simultaneously, reducing the burden of long-term operating and maintenance costs at the lowest possible capital investment by utilizing strategic planning and purchasing, and capitalizing on utility-provided retrofit incentives. This philosophy has resulted in providing simple and concise energy efficiency projects which encompass improvements at all DSBN facilities.

The following diagram demonstrates the energy and cost flows for a typical DSBN facility. It helps to simplify the planning process for new energy efficiency programs by visualizing which major facility systems use the most energy versus which systems have the highest operating costs. In all energy efficiency and conservation programs, the trade-off between reducing energy use and energy costs needs to be examined to find the optimal balance for capital and operational investment dollars.

Space Heating

Connected Lighting

Total Energy Use

Total Energy Cost

Plug Loads

Ventilation, Pumping

Domestic Hot Water

Figure 1: Typical DSBN Facility Flow Diagram<sup>5</sup>

- 2. The Board has an energy management position which includes the following options.
  - In-house including:
    - a. Full time
    - b. Part time
    - c. Shared job function
  - Contracted third party, or
  - None
- 3. Energy Management Strategies

Energy management strategies fall into four key categories:

- 1. Design/Construction/Retrofit
- 2. Operations and Maintenance
- 3. Occupant Behaviour

 $<sup>^{\</sup>rm 5}$  Sankey from Excel: acknowledgement for d3.js and sankey diagram to Mike Bostok

#### **Design/Construction/Retrofit**

#### <u>Definition</u>

Design, construction, and retrofit includes the original and ongoing intent of how a building and its systems are to work through the combination of disciplines such as architecture and engineering.

For the Board's relevant projects over the next five years, please refer to **Appendix IV**: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023, Part A: Design, Construction, and Retrofit.

Some highlights of Design/Construction/Retrofit projects/programs over the next five years include:

- All elementary gymnasium lighting converted to LED fixtures with occupancy sensors and manual dimming. This will allow energy savings and improve lighting for presentations and performances.
- On-going investment in condensing boilers at select facilities which currently utilize atmospheric boiler systems.
- New window installations utilizing high-performance window specifications, along with improving door insulation and air sealing values.
- Significant investments in new roofs with improved roof insulation values.

#### **Operations and Maintenance**

#### Definition

Operations and maintenance include the strategies the Board uses to make sure that the existing buildings and equipment performs at maximum efficiency. For the Board's relevant projects over the next five years, please refer to Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023, Part B: Operations and Maintenance.

Some highlights of Operations and Maintenance projects/programs over the next five years include:

- Updating controls of outdoor lighting to turn off all exterior lighting when the building is unoccupied.
- Recommissioning select Building Automation Systems (BAS) to optimize HVAC system setpoints and schedules.

 Cleaning building radiator heating systems and ensuring valves and thermostats are working properly.

#### **Occupant Behaviour**

#### **Definition**

Strategies that the Board uses to educate occupants, including staff, students and community users, with an emphasis on changing specific actions to reduce energy consumption. For the Board's relevant projects over the next five years, please refer to Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023, Part C: Occupant Behaviour.

Some highlights of Occupancy Behaviour programs over the next five years include:

 Continuing the use of RETScreen Expert energy management software to set benchmarks and complete project analysis for on-going energy efficiency programs.

#### A. Future Energy Conservation Goals

The Board has set out the following energy intensity reduction conservation goals for the next five fiscal years.

**Table 7: Annual Energy Intensity Conservation Goals** 

Annual Energy Intensity Conservation Goal	Fiscal Year 2018/2019	Fiscal Year 2019/2020	Fiscal Year 2020/2021	Fiscal Year 2021/2022	Fiscal Year 2022/2023
ekWh/ft²	0.17	0.17	0.17	0.17	0.17
ekWh/m²	1.8	1.8	1.8	1.8	1.8
Percentage Decrease	1	1	1	1	1

The following table shows the Board's Cumulative Energy Intensity Conservation Goal for the next five fiscal years.

**Table 8: Cumulative Conservation Goal** 

	Fiscal Year 2018/2019
Cumulative Conservation Goal	through
	Fiscal Year 2022/2023
ekWh/ft²	0.85
ekWh/m²	9.0
Percentage Decrease	5

The DSBN has employed industry-leading energy management software call RETScreen Expert to manage the portfolio of schools to meet the above goals. The DSBN continues to have a strategic partnership with Natural Resources Canada (holder of the RETScreen patent) to ensure the portfolio is up-to-date with the latest energy management tools. Utilizing this software, the DSBN can manage our facility portfolio in the most efficient way possible, while keeping administrative costs to a minimum.

#### NOTE TO READERS:

There are many factors that influence a board's ability to meet energy conservation goals. A list of some of these factors include, but are not limited to, in the following changes:

#### 1. Changes in Programming

#### For example:

• Introduction of Before and After School Programs to schools meant that the number of hours that a facility's HVAC system operates daily was expanded by four or more hours per weekday to reflect the longer occupancy hours.

#### 2. Changes to the Ontario Building Code

#### For example:

Regular changes/updates to the Ontario Building Code can impact energy use. For
example, an increase in levels of ventilation in newly constructed buildings or other
requirements. As a result, more fresh air is brought into a school to meet the
ventilation requirements throughout the day requires heating and cooling of the air
(dependent on the season) to meet standard classroom temperatures.

#### 3. Changes to School Board Funding Models

- Forecasted Conservation Goals are based on current funding models being in place throughout the next five years.
- All boards' funding is determined on an annual basis. Any changes to the funding model will impact forecasted values.

#### 4. Changes in Technology

 Forecasted Conservation Goals are based on current technologies and related energy savings. If new technologies become available, anticipated energy savings may increase.

#### **B.** Energy Efficiency Incentives

The Board applies to incentive programs to support the implementation of energy efficient projects on a regular basis.
Yes No
If yes, between Fiscal Year 2013/2014 and Fiscal Year 2017/2018, the Board has applied for \$402,073 in incentive funding from different agencies to support the implementation of energy efficient projects.
The Board uses the services of the sector's Incentive Programs Advisor (IPA).  Yes No

### C. Energy Procurement

	1.	Yes No
		If yes,  OECM's Strategic Electricity Management and Advisory Services  Other:
	2.	The Board participates in a consortia arrangement to purchase natural gas.  Yes No
		If yes,  ☐ Ontario Education Collaborative Marketplace's (also known as OECM)  Natural Gas Management and Advisory Services ☐ Catholic School Board Services Association' (also known as CSBSA) Natural Gas Management and Advisory Services ☐ Other:
D. <u>D</u>	em	nand Management
	1.	The Board uses the following method(s) to monitor electrical Demand:  Invoices Real-time data Online data from the Local Distribution Company (LDC) Other:
	2.	The Board uses the following methodologies to cut down electrical Demand:  Equipment scheduling  Phased/staged use of equipment  Demand-limit equipment  Deferred start-up of large equipment (e.g. chiller start-up in spring)

# E. <u>Senior Management Approval of this Energy Conservation and Demand</u> <u>Management Plan</u>

I confirm that District School Board of Niagara senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Full Name:	Graeme McKenzie	
Job Title:	<b>Energy Coordinator</b>	
-		
Date: _	June 26, 2019	

## Appendix I: Energy Consumption and Greenhouse Gas Emissions – Fiscal Year 2017/2018

<b>Energy Consumption and Gr</b>	eenhouse Gas Emissions Reporting	- for 2017
Confirm consecutive 12-mth period		
(mth-yr to mth-yr)	Sept/2017 - Aug/2018	
Sector	School Board	
Agency Sub-sector	School Board	
Organization Name	District School Board Of Niagara	

				T					Number					1			
					Total Floor		Avg	Swimming Pool	of	Electricity	Electricity	Natural Gas		Propane		GHG Emissions	Energy Intensity
Operation Name	Operation Type	Address	City	Postal Code	Area	Unit	hrs/wk	(Yes/No)	Portables	Quantity	Unit	Quantity	Natural Gas Unit		Propane Unit	(Kg)	(ekWh/sqft)
A K Wigg PS	School	1337 Haist St	Fonthill	LOS 1EO	27,959.50 S	quare feet	60	No	0	111,119.08240	kWh	45,592.96828	3 Cubic Meter	•		88,121.43472	21.30478
A N Myer SS	School	6338 O'Neil St	Niagara Falls	L2J 1M7	150,628.40 S	quare feet	80	No	0	894,778.78906		283,627.91966	Cubic Meter			551,712.48635	25.95203
Alternative Pathways Centre (forme	er School	1A Caroline St	St. Catharines	L2T 3E9	28,616.29 S	quare feet	60	No	0	110,200.03247	kWh	42,738.87975	Cubic Meter			82,709.52016	19.72371
Applewood PS	School	130 Woodrow St	St. Catharines	L2P 3T7	20,680.84 S	quare feet	60	No	0	134,749.42773	kWh	15,884.06305	Cubic Meter			32,361.73407	14.67840
Beamsville District SS	School	4317 Central Ave	Beamsville	LOR 1BO	188,245.60 S	quare feet	80	No	0	904,182.60547	kWh	277,694.58435	Cubic Meter			540,657.42963	20.48100
Bertie PS - SOLD June 2018	School	3770 Hazel St	Ridgeway	LOS 1NO	33,136.05 S	quare feet	60	No	0	47,714.06336	kWh	26,336.12133	3 Cubic Meter			50,617.13993	9.88677
Burleigh Hill PS	School	15 Burleigh Hill Dr	St. Catharines	L2T 2V6	22,522.86 S	quare feet	60	No	0	94,028.66443	kWh	65,723.40078	3 Cubic Meter			125,884.94389	35.18746
Caistor Central PS	School	1794 Regional Rd 6	Caistor Centre	LOR 1EO	25,660.52 S	quare feet	60	No	0	97,026.69693	kWh	37,539.21040	Cubic Meter			72,651.01255	19.32872
Carleton PS	School	1 Carlton Park Dr	St. Catharines	L2M 4M9	39,852.41 S	•	60	No	0	144,458.18378		60,256.02706				116,420.50934	19.69381
Central PS	School	10 Livingston Ave	Grimsby	L3M 1K7	53,594.80 S	•	60	No	1	172,155.00000		51,140.93272				99,666.36539	13.35334
Cherrywood Acres PS	School	4635 Pettit Ave	Niagara Falls	L2E 6L4	25,195.73 S	•	60	No	0	97,170.69141		=	Cubic Meter			95,897.19264	24.87678
College Street PS - closed 23/01/203		132 College St	Smithville	LOR 2AO	44,150.98 S	•	60	No	0	92,586.19485		58,912.91819				112,983.90977	16.27822
Connaught PS	School	28 Prince St	St. Catharines	L2R 3X7	55,781.38 S		60	No	0	179,648.00977		-	Cubic Meter			105,653.46528	13.55451
Crossroads PS	School	1350 Niagara Stone Rd	Niagara-On-The-Lake	LOS 1J0	56,474.04 S	•	60	No	0	333,852.70856			Cubic Meter			72,951.15091	12.59818
Crystal Beach PS - SOLD July 2018 Dalewood PS	School	145 Derby Rd 61 Duncan Dr	Crystal Beach	LOS 1B0 L2N 3P3	21,715.65 See 41,300.91 See	•	60	No	1 0	26,614.45094 114,053.47974		33,810.56253				64,383.53918	17.77269
DeWitt Carter PS	School School	435 Fares St	St. Catharines Port Colborne	L3K 1X4	54,404.46 S	•	60 60	No No	0	139,171.25479		=	Cubic Meter Cubic Meter			112,915.54296 101,534.87549	17.86147 12.80035
Diamond Trail PS	School	315 Southworth St S	Welland	L3R 174 L3B 1Z8	43,387.92 S	•	60	No	0	198.268.06067		26,586.14567				53,694.12575	11.08188
DSBN Academy	School	130 Louth St	St. Catharines	L2S 2T4	138,460.37 S	•	80	No	0	882,950.16406		161,967.38292				321,493.17920	18.80902
E I McCulley PS	School	16 Berkley Dr	St. Catharines	L2M 6B8	23,381.92 S	-	60	No	0	222,924.45850		20,171.26604				41,992.48747	18.70249
E L Crossley SS	School	350 Hwy 20	Fonthill	LOS 1EO	177,715.80 S	•	80	No	0	743,863.10938		251,242.54178				487,873.27710	19.21052
Eastdale SS	School	170 Wellington St	Welland	L3B 1B3	122,620.80 S	•	80	No	0	507,202.94458		209,567.53335				404,987.63342	22.29997
Eden HS	School	535 Lake St, Bldg 1	St. Catharines	L2N 4H7	149,074.87 S	•	80	No	0	1,010,228.00000		193,629.77247				383,556.59977	20.58081
Edith Cavell PS	School	1 Monck St	St. Catharines	L2S 1L5	42,854.49 S	•	60	No	0	167,160.31079		74,940.18191				144,575.47036	22.48558
Education Centre			St. Catharines	L2R 7P4	78,374.08 S	•	60	No	0	1,238,600.10156		18,978.65844				57,306.86863	18.37726
Ferndale PS	School	35 Ferndale Ave	St. Catharines	L2P 1V8	44,357.43 S	quare feet	60	No	0	167,501.69360	kWh	49,053.05335	Cubic Meter			95,638.47140	15.52900
Fitch Street PS	School	164 Fitch St	Welland	L3C 4V5	32,785.66 S	quare feet	60	No	0	89,230.67578	kWh	41,788.51620	Cubic Meter			80,550.00925	16.26777
Forestview PS	School	8406 Forestview Blvd	Niagara Falls	L2H 0B9	56,058.06 S	quare feet	60	No	7	336,369.87500	kWh	38,519.47043	3 Cubic Meter			78,644.47691	13.30310
Fort Erie PS	School	474 Central Ave	Fort Erie	L2A 3T7	33,709.16 S	quare feet	60	No	0	54,047.90174	kWh	50,324.32426	Cubic Meter			96,079.44681	17.46954
Fort Erie SS - Closed July 2017	School	7 Tait Ave	Fort Erie	L2A 3P1	164,152.50 S	quare feet	80	No	0	271,945.00000	kWh	173,286.77805	Cubic Meter			332,324.76594	12.87582
Gainsborough PS	School	5459 Hwy 20	St. Ann's	LOR 1YO	31,167.05 S	quare feet	60	No	0	175,242.58496	kWh	61,975.03616	6 Cubic Meter			120,203.02293	26.75580
Garrison Road PS	School	1110 Garrison Rd	Fort Erie	L2A 1N9	49,057.59 S	quare feet	60	No	2	279,068.00000	kWh	75,298.17981				147,188.09007	22.00109
Glen Ridge PS - Sold Nov 15, 2017	School	101 South Dr	St. Catharines	L2R 4V7	6,499.90 S	•	60	No	0	5,794.65521			7 Cubic Meter			283.63993	1.05011
Glendale PS	School	24 Farnham Ave	Welland	L3C 3R1	22,471.82 S	-	60	No	0	62,348.77319		33,810.51794				65,001.58718	18.76481
Glynn A Green PS	School	1353 Pelham St	Fonthill	LOS 1EO	44,433.10 S	•	60	No	0	161,123.17261		47,282.08724				92,179.89939	14.93541
	School	468 Thorold Rd W	Welland	L3C 3W6	35,804.29 S	•	60	No	6	205,326.35110		53,532.38272				104,761.50336	21.62469
Governor Simcoe SS	School	15 Glenview Ave	St. Catharines	L2N 2Z7	134,202.80 S	•	80	No	0	1,158,787.38281		136,330.14084				277,794.14933	19.43084
Gracefield PS	School	117 Bayview Dr	St. Catharines	L2N 4Z7	20,296.93 S	•	60		0	117,936.92822		•	Cubic Meter			51,950.29321	19.63337
Grand Avenue PS	School	14 Grand Ave	Grimsby	L3M 2R7	36,525.56 S		60	No	0	175,049.00000		•	Cubic Meter			114,462.00710	21.94224
Grapeview PS	School	106 First St Louth	St. Catharines	L2R 6P9	53,898.67 S	-	60	No	4	570,338.00000 683,345.00000		· ·	Cubic Meter Cubic Meter			53,066.34555	15.08723
Greater Fort Erie SS Greendale PS	School School	1640 Garrison Rd 5504 Montrose Rd	Fort Erie Niagara Falls	L2A 5M4 L2H 1K7	114,931.65 Sec. 28,587.11 Sec.	-	80 60	No No	1	134,665.36377		49,465.13153				180,867.90129 95,849.55469	14.21376 23.10026
Grimsby SS	School	5 Boulton Ave	Grimsby	L3M 1H6	157,312.50 S	-	80	No	0	813,367.00000		239,508.36624				466,890.60631	21.35119
Harriet Tubman PS	School	84 Henry St.	St. Catharines	L2R 5V4	58,488.18 S	-	60	No	0	277,931.69922		51,360.48911				101,911.18998	14.08455
Heximer Avenue PS	School	6727 Heximer Ave	Niagara Falls	L2G 4T1	28,703.26 S	-	60	No	0	102,744.00000			Cubic Meter			87,502.14556	20.36804
Jacob Beam PS	School	4300 William St	Beamsville	LOR 1B0	31,490.96 S	-	60	No	0	115,029.33398		-	3 Cubic Meter			108,441.72280	22.65499
James Morden PS	School	7112 Dorchester Rd	Niagara Falls	L2G 5V6	38,305.74 S	-	60	No	0	165,336.72559		-	2 Cubic Meter			114,016.49498	20.62825
Jeanne Sauve PS	School	91 Bunting Rd	St. Catharines	L2P 3G8	102,527.61 S	-	80	No	0	627,005.14844		118,260.14880				234,431.76540	18.37405
John Brant PS	School	143 Ridge Rd	Ridgeway	LOS 1NO	52,952.28 S	-	60	No	0	215,809.00000		29,922.42347				60,305.20581	10.08111
John Marshall PS	School	3910 St James Ave	Niagara Falls	L2J 2R3	33,476.12 S	-	60	No	2	189,830.01675		60,883.13635				118,390.98105	24.99939
Kate S. Durdan PS	School	6855 Kalar Rd	Niagara Falls	L2H 2T3	93,490.81 S	-	60	No	13	679,989.61719			Cubic Meter			156,549.03643	15.97888
Lakeview PS	School	33 Olive St	Grimsby	L3M 2B9	41,242.25 S	=	60	No	0	108,437.93396			2 Cubic Meter			117,263.68821	18.35661
Laura Secord SS	School	349 Niagara St	St. Catharines	L2M 4V9	113,242.30 S	•	80	No	0	645,035.00000		-	3 Cubic Meter			188,902.39304	14.51922
Lifetime Learning Centre	School	535 Lake St. Bldg 2	St. Catharines	L2N 4H7	22,968.57 S		80	No	0				L Cubic Meter			34,787.41128	8.51382
Lincoln Centennial PS	School	348 Scott St	St. Catharines	L2N 1J5	33,316.49 S	quare feet	60	No	0	133,187.62878	kWh	40,842.89376	Cubic Meter			79,522.55731	17.02631
Lockview PS	School	505 Bunting Rd	St. Catharines	L2M 3A9	34,559.64 S	quare feet	60	No	0	124,444.70630	kWh	45,904.37839	O Cubic Meter			88,940.70172	17.71738
Martha Cullimore PS	School	3155 St Andrew Ave	Niagara Falls	L2J 2R7	24,422.58 S	quare feet	60	No	0	74,252.00014	kWh	36,700.93789	Cubic Meter			70,672.19520	19.01115
McKay PS	School	320 Fielden Ave	Port Colborne	L3K 4T7	43,386.83 S	quare feet	60	No	0	161,181.93075	kWh		3 Cubic Meter			119,540.25330	18.84167
Nelles PS	School	118 Main St E	Grimsby	L3M 1N8	39,025.57 S	quare feet	60	No	4	269,252.00000	kWh	31,190.32123	3 Cubic Meter			63,626.78454	15.39339
Oakridge PS	School	1 Marsdale Dr	St. Catharines	L2T 3R7	32,204.36 S	quare feet	60	No	0	119,558.17627	kWh	33,575.36757	7 Cubic Meter			65,546.61379	14.79271

Oakwood PS	School	255 Omer Ave	Port Colborne	L3K 3Z1	24,589.08 Square feet	60	No	0	75,803.51450 kWh	31,653.78723 Cubic Meter		61,156.75399	16.76406
Ontario PS	School	550 Allanburg Rd	Thorold	L2V 1A8	27,585.85 Square feet	60	No	0	121,279.99890 kWh	40,908.04271 Cubic Meter		79,439.75148	20.15677
Orchard Park PS	School	3691 Dorchester Rd	Niagara Falls	L2J 3A6	33,746.62 Square feet	60	No	0	232,854.25659 kWh	76,277.64335 Cubic Meter		148,240.48494	30.92209
Park PS	School	217 Main St E	Grimsby	L3M 1P5	16,527.53 Square feet	60	No	0	67,457.99822 kWh	38,535.16526 Cubic Meter		74,022.51235	28.86101
Parliament Oak PS - Sold Feb 2018		325 King St	Niagara-On-The-Lake	LOS 1JO	16,326.22 Square feet	60	No	0	23,275.54816 kWh	30,014.07504 Cubic Meter		57,148.04108	20.96373
Parnall PS	School	507 Geneva St	St. Catharines	L2N 2H7	35,563.96 Square feet	60	No	0	149,865.29346 kWh	67,392.02349 Cubic Meter		130,005.54905	24.35310
Peace Bridge PS	School	105 Torrance St	Fort Erie	L2A 2C1	35,627.88 Square feet	60	No	4	197,220.96321 kWh	37,128.35828 Cubic Meter		73,607.40486	16.61095
Pelham Centre PS - Closed July 20:		1165 Centre St	Fenwick	LOS 1CO	20,356.94 Square feet	60	No	0	133,047.25330 kWh	8,647.83218 Cubic Meter		18,651.27640	11.05051
Pine Grove PS	School	690 Lake St	St. Catharines	L2N 4J5	39,343.06 Square feet	60	No	2	168,776.57428 kWh	44,809.67469 Cubic Meter		87,637.87801	16.39435
Plymouth PS	School	111 First St	Welland	L3B 4S1	34,555.40 Square feet	60	No	0	135,310.77124 kWh	58,310.44798 Cubic Meter		112,583.91305	21.84959
Port Colborne HS	School	211 Elgin St	Port Colborne	L3K 3K4	200,225.00 Square feet	80	No	0	681,462.00000 kWh	259,557.93708 Cubic Meter		502,515.17358	17.18060
Port Weller PS	School	273 Parnell Rd	St. Catharines	L2M 1W4	28,790.59 Square feet	60	No	0	106,669.73340 kWh	51,587.80896 Cubic Meter		99,378.47754	22.74818
Power Glen PS	School	34 Westland St	St. Catharines	L2S 4C1	44,140.86 Square feet	60	No	0	254,184.00000 kWh	45,857.35438 Cubic Meter		91,096.02718	16.79953
Prince of Wales PS (SC)	School	95 Facer St	St. Catharines	L2M 5J6	33,942.05 Square feet	60	No	0	130,939.89490 kWh	42,810.15500 Cubic Meter		83,203.03322	17.26227
Prince of Wales PS (TH)	School	40 Pine St	Thorold	L2V 3L4	40,638.61 Square feet	60	No	0	145,162.18408 kWh	64,547.30586 Cubic Meter		124,545.89469	20.45239
Prince Philip PS (NF)	School	3112 Dorchester Rd	Niagara Falls	L2J 2Z7	33,171.13 Square feet	60	No	3	177,091.56152 kWh	49,517.87398 Cubic Meter		96,683.15936	21.20387
Prince Philip PS (SC)	School	600 Vine St	St. Catharines	L2M 3V1	38,534.63 Square feet	60	No	0	149,020.18884 kWh	30,006.14031 Cubic Meter		59,308.17026	12.14281
Princess Elizabeth PS	School	330 Scholfield Ave	Welland	L3B 1P2	33,568.64 Square feet	60	No	2	139,480.51647 kWh	57,053.62601 Cubic Meter		110,279.85976	22.21817
Princess Margaret PS	School	6624 Culp St	Niagara Falls	L2G 2C4	64,016.42 Square feet	60	No	0	238,114.03711 kWh	133,559.54975 Cubic Meter		256,630.18748	25.89266
Quaker Road PS	School	333 Quaker Rd	Welland	L3C 3G7	39,693.96 Square feet	60	No	0	184,227.62701 kWh	56,221.02086 Cubic Meter		109,479.74950	19.69398
Queen Mary PS (closed) & St Cath		34 Catherine St	St. Catharines	L2R 5E7	229,491.60 Square feet	80	No	0	1,082,075.48572 kWh	300,275.33241 Cubic Meter		586,426.39263	18.62088
Richmond Street PS	School	153 Richmond St	Thorold	L2V 3H3	48,098.85 Square feet	60	No	2	178,464.65839 kWh	58,428.83549 Cubic Meter		113,554.21562	16.62063
Ridgeway-Crystal Beach HS - Close		576 Ridge Rd	Ridgeway	LOS 1NO	80,434.07 Square feet	80	No	0	106,709.00000 kWh	80,891.63746 Cubic Meter		154,781.76613	12.01490
River View PS	School	3300 Cattell Dr	Niagara Falls	L2G 6M9	34,169.91 Square feet	60	No	2	186,062.66699 kWh	49,589.84570 Cubic Meter		96,974.41322	20.86902
Ross PS	School	358 Niagara St	Welland	L3C 1K9	44,252.80 Square feet	60	No	1	148,143.77086 kWh	41,292.16324 Cubic Meter		80,630.66966	13.26442
Senator Gibson PS	School	4944 John St	Beamsville	LOR 1B6	50,184.79 Square feet	60	No	1	278,449.41895 kWh	60,800.45896 Cubic Meter		119,767.60738	18.42437
Simcoe Street PS	School	4760 Simcoe St	Niagara Falls	L2E 1V6	34,120.09 Square feet	60	No	0	123,816.23474 kWh	41,546.06555 Cubic Meter		80,689.88649	16.56967
Sir Winston Churchill SS	School	101 Glen Morris Dr	St. Catharines	L2T 2N1	121,076.61 Square feet	80	No	2	706,126.00000 kWh	121,906.58048 Cubic Meter		242,694.44008	16.53269
Smith PS	School	18 Oakes Rd N	Grimsby	L3M 4B1	31,224.25 Square feet	60	No	4	212,805.00000 kWh	31,381.44886 Cubic Meter		63,011.71540	17.49666
Smithville PS (Formerly South Linc	olr School	260 Canborough St	Smithville	LOR 2A0	61,046.98 Square feet	80	No	0	244,413.25195 kWh	67,519.45404 Cubic Meter		131,881.96326	15.75827
St Davids PS	School	1344 York Rd	St. Davids	LOS 1PO	33,573.58 Square feet	60	No	0	247,390.34052 kWh	38,356.26734 Cubic Meter		76,796.75275	19.51035
St. Catharines Service Centre	Administrative offices and related facilities	•	St. Catharines	L2P 3J3	24,740.88 Square feet	60	No	0	110,814.74536 kWh	32,331.61414 Cubic Meter		63,043.89611	18.36749
St. Johns Adventure Campus	Other	2984 Holland Rd RR#1 Rd	Fonthill	LOS 1EO	3,319.92 Square feet	40	No	0	13,488.19997 kWh		7,626.33261 Litre	11,985.37542	20.21300
Stamford Collegiate SS	School	5775 Drummond Rd	Niagara Falls	L2G 4L2	149,192.64 Square feet	80	No	0	750,475.19922 kWh	210,155.81883 Cubic Meter		410,307.98528	20.00075
Steele Street PS	School	214 Steele St	Port Colborne	L3K 4X7	38,088.53 Square feet	60	No	0	140,064.60916 kWh	30,114.71073 Cubic Meter		59,358.52282	12.08020
Stevensville PS	School	3521 Main St E	Stevensville	LOS 1S0	39,625.72 Square feet	60	No	1	203,306.00000 kWh	71,787.30246 Cubic Meter		139,239.79948	24.38430
Sven H Dohnberg Centre	Administrative offices and related facilities	535 Lake St. Bldg 3 St	St. Catharines	L2N 4H7	5,751.91 Square feet	80	No	0		7,046.16641 Cubic Meter		13,321.67245	13.01917
Thorold SS	School	50 Ormond St N	Thorold	L2V 1Z1	131,595.80 Square feet	80	No	0	533,742.11328 kWh	149,308.19781 Cubic Meter		291,518.78118	16.11416
Twenty Valley PS	School	4057 Victoria Ave	Vineland	LOR 2CO	49,639.03 Square feet	60	No	0	218,687.77734 kWh	29,674.56800 Cubic Meter		59,886.40065	10.75892
Valley Way PS	School	5315 Valley Way	Niagara Falls	L2E 1X4	20,618.91 Square feet	60	No	0	114,941.36888 kWh	52,097.34193 Cubic Meter		100,484.89709	32.42753
Victoria PS	School	5635 Heritage Dr	Niagara Falls	L2J 4B3	19,726.16 Square feet	60	No	0	75,682.99966 kWh	25,061.46284 Cubic Meter		48,691.04283	17.33894
Walker Living Campus	Other	1 Taylor R Rd	Niagara-on-the-Lake	LOS 1JO	10,401.10 Square feet	10	No	0	38,615.35411 kWh		17,859.66712 Litre	28,189.42968	15.78475
Welland Centennial SS	School	240 Thorold Rd W	Welland	L3C 3W2	145,483.19 Square feet	80	No	0	1,044,932.00000 kWh	248,549.55327 Cubic Meter		487,989.72999	25.33943
Welland Service Centre	Administrative offices and related facilities	120 Federal Rd	Welland	L3B 3P2	10,427.13 Square feet	60	No	0	56,320.09534 kWh	11,108.36934 Cubic Meter		21,976.00802	16.72343
Wellington Heights PS	School	9 Alsop Ave	Fenwick	LOS 1EO	33,452.18 Square feet	60	No	0	150,686.52734 kWh	31,396.24322 Cubic Meter		61,965.16068	14.47914
Westdale PS	School	130 Rykert St	St. Catharines	L2S 2B4	42,093.13 Square feet	60	No	1	161,989.18774 kWh	49,776.24861 Cubic Meter		96,910.40855	16.41598
Westlane SS	School	5960 Pitton Rd	Niagara Falls	L2H 1T5	142,346.70 Square feet	80	No	0	670,871.32227 kWh	197,894.80293 Cubic Meter		385,749.98971	19.48800
Westmount PS	School	73 Ann St W	Thorold	L2V 2J8	23,403.65 Square feet	60	No	0	90,636.21875 kWh	41,932.64997 Cubic Meter		80,846.82553	22.91468
William E Brown PS	School	31870 Lee St	Wainfleet	LOS 1VO	25,085.80 Square feet	60	No	0	78,054.73389 kWh	46,876.13652 Cubic Meter		89,975.48015	22.97092
William Hamilton Merritt PS	School	114 Linwell Rd	St. Catharines	L2N 6N8	32,674.38 Square feet	60	No	0	118,047.02356 kWh	26,416.24335 Cubic Meter		51,985.24034	12.20507
Winger PS	School	53220 Winger Rd	Wainfleet	LOS 1VO	26,236.71 Square feet	60	No	0	249,038.82861 kWh	14,361.33417 Cubic Meter		31,459.79980	15.30938
Woodland PS	School	1511 7th St Louth	St. Catharines	L2R 6P9	27,007.86 Square feet	60	No	0	106,318.71814 kWh	42,054.17378 Cubic Meter		81,347.85759	20.48519

# Appendix II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018

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#### Design, Construction and Retrofit Strategies

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Lighting	Investments in Energy Management Strategies	Investment in Energy Management Strategies			
High-efficiency Lighting Systems (T-8, T-5, CFL, LED)	\$ 487,405	\$ 35,794	\$ 725,898	\$ 1,160,727	\$ 930,387
Daylight Sensors	\$ -	\$ -	\$ -	\$ -	\$ -
Outdoor Lighting	-	\$	\$ 103,775	\$ 13,137	\$ -
Occupancy Sensors	-	\$	ş -	-	\$ -
Daylight Harvesting	\$ -	\$	\$ -	-	\$ -
Other (Describe)	\$ -	\$	\$ -	\$ -	\$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
HVAC	Investment in Energy Management Strategies				
Efficient Boilers (near condensing)	s -	ş -	s -	-	s -
High-efficiency Boilers (condensing)	\$ 358,066	\$ 110,490	\$ 385,381	\$ 547,493	\$ 1,341,529
High-efficiency Boiler Burners	s -	\$ -	ş -	\$ -	\$ -
Geothermal	s -	\$ -	\$ -	\$ -	\$ -
Heat Recovery/Enthalpy Wheels	s -	-	ş -	\$ -	\$ -
Economizers	-	\$	\$ -	\$	\$ -
Energy Efficient HVAC Systems	\$ 676,804	\$ 973,394	\$ 1,562,296	\$ 6,646,691	\$ 10,017,781
Energy Efficient Rooftop Units	-	\$ -	\$ -	\$	\$ -
High-efficiency Domestic Hot Water	\$ -	\$	\$ -	\$ -	\$ -
Efficient Chillers and Controls	\$ -	\$ -	\$ -	\$ -	\$ -
High-efficiency Motors	s -	\$ -	\$ -	\$	\$ -
VFD	s -	\$ -	\$ -	\$ -	s -
Demand Ventilation	\$ -	\$ -	\$ -	\$ -	\$ -
Entrance Heater Controls	s -	\$ -	\$ -	\$ -	\$ -
Other (Describe)	-	\$	\$	\$	\$

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Controls	Investment in Energy Management Strategies				
Building Automation Systems - New	s -	s -	s -	\$ -	\$ -
Building Automation Systems - Upgrade	s -	-	s -	\$ 11,595	\$ -
Other (Describe)	s -	\$ -	\$ -	\$ -	\$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Building Envelope	Investment in Energy Management Strategies				
Glazing	s -	\$ -	-	\$ -	\$ -
Increased Wall Insulation	\$ 1,914,141	\$ 291,434	\$ 559,043	\$ -	\$ -
New Roof	\$ 1,419,325	\$ 1,549,044	\$ 1,618,336	\$ 1,966,293	\$ 1,817,652
New Windows	\$ 127,496	\$ 262,713	\$ 89,339	\$ 1,157,220	\$ 546,752
Treatments	\$ 30,556	\$ 33,166	\$ 8,163	\$ 94,151	\$ 51,085
Shading Devices	s -	s -	\$ -	\$ -	\$ -
Other (Describe)	s -	\$ -	\$ -	-	\$ -
Total Investment in Design, Construction and Retrofit Strategies	\$ 5,013,793	\$ 3,256,037	\$ 5,052,231	\$ 11,597,307	\$ 14,705,186

#### Appendix II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018

#### **Operations and Maintenance Strategies**

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Policy and Planning	Investment in Energy Management Strategies	Investment in Energy Management Strategies			
New School Design/Construction Guidelines and Specifications	\$ -	\$ -	\$ -	\$ -	\$ -
Day and Night Temperature Guidelines for all Schools	\$ -	\$	\$	\$ -	\$
Nighttime Blackout of Sites - Interior	\$ -	\$ -	\$ -	\$ -	-
Nighttime Blackout of Sites - Exterior	\$ -	\$ -	\$ -	\$ -	\$ -
Procures Only Energy Star Certified Appliances	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Daylight Harvesting (servicing)	\$ -	\$ -	\$ -	\$ -	\$ -
Demand Ventilation (servicing)	-	-	\$ -	\$ -	-
Other (Describe)	\$ -	\$ -	\$ -	\$ -	\$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Energy Audits	Investment in Energy Management Strategies	Investment in Energy Management Strategies			
Walk Through Audit	\$ 2,500	\$ 17,268	\$ 22,045	\$ -	\$ -
Engineering Audit	\$ -	\$ -	\$ -	\$ -	\$ -
Other (Describe)					
Total Investment in Operations and Maintenance Strategies	\$ 12,500	\$ 27,268	\$ 32,045	\$ 10,000	\$ 10,000

#### Appendix II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018

#### Occupant Behaviour Strategies

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Training and Education	Estimated Cost of Implementation				
Building Operator Training	\$ -	\$ -	\$ -	\$ -	\$ -
NRCan Benchmarking Program	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Building Automation Training (site specific)	\$ -	\$ -	\$ -	\$ -	\$ -
Ongoing Training and Awareness Programs for Energy Conservation	\$ -	\$ -	\$ -	\$ -	\$ -
Provide Detailed Information on Building Operational Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Provide Detailed Information on Energy Consumption (e.g. via the Utility Consumption Database or other database)	\$ -	\$ -	\$ -	\$ -	\$ -
Participate in Environmental Programs, such as EcoSchools, Earthcare	\$ -	\$ -	\$ -	\$ -	\$ -
Other tools (Define)	\$ -	\$ -	\$ -	\$ -	\$ -
Total Investment in Occupant Behaviour Strategies	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000

#### Investments in Energy Management Strategies

Summary of Investment by Type						
	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2013/2014-2017/2018
Total Investments in Energy Management Strategies FY 2012-13 to FY 2017-18	Investment in Energy Management Strategies	Total Investment in Energy Management Strategies				
Design, Construction and Retrofit Investments Total	\$ 5,013,793	\$ 3,256,037	\$ 5,052,231	\$ 11,597,307	\$ 14,705,186	39,624,555
Operations and Maintenance Investments Total	\$ 12,500	\$ 27,268	\$ 32,045	\$ 10,000	\$ 10,000	91,813
Occupant Behaviour Investments Total	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	50,000
Total Investment Per Fiscal Year	\$ 5,036,293	\$ 3,293,305	\$ 5,094,276	\$ 11,617,307	\$ 14,725,186	39,766,368

## Appendix III:

DSBN Energy Conservation Measures – Fiscal Year 2014/2015 to Fiscal Year 2017/2018

Fiscal Year 2015-20	110								
Fiscal Teal 2013-20	710	General			Finance		Energy 8	& Cost Savings	
Facility	Municipality	Measure Name	Date of Installation/ Completion	Cost Installed (\$)	Cost with Incentive (\$)	Demand Savings (kW)	Energy Savings (kWh)	Annual Cost Savings (\$)	Payback (Years)
Pine Grove PS	St. Catharines	Lighting Retrofit	Sep-14	\$24,000	\$17,519	14.6	58,355	\$6,609.37	2.65
Pine Grove PS Jeanne Sauve PS	St. Catharines St. Catharines	Occupancy Sensors Energy Audit	Sep-14	\$3,508 \$5,964	\$2,692.59 \$3,055	1.6 0.0	53,333	\$5,102.67 \$0.00	0.53
Education Centre	St. Catharines	Driveway Lighting Removal / Horizon Parnership	Nov-14 Jan-15	\$3,964 \$0	\$3,033 \$0	1.2	- 5,256	\$0.00 \$744.65	- Immediate
DSBN Academy	St. Catharines	Outdoor Lighting Retrofit	May-15	\$8,180	\$6, <b>7</b> 20	0.0	5,602	\$691.85	9.71
Jeanne Sauve PS	St. Catharines	E12-Decommission Tech Wing Air Compressor	Jun-15	\$0	\$0	8.1	2,417	\$619.33	Immediate
Jeanne Sauve PS	St. Catharines	E15-Eliminate Electric Room Heater	Jun-15	\$82	\$82	0.9	104	\$47.08	1.74
Education Centre	St. Catharines	Atrium Lighting Retrofit	Jul-15	\$13,200	\$11,400	4.5	15,375	\$2,257.06	5.05
St. Catharines Service Centre Welland Service Centre		Electric baseboard shutdown Electric baseboard shutdown	Jul-15 Jul-15	\$277 \$337	\$277 \$176	120.0 40.0	70,236 23,412	\$9,620.61 \$3,206.87	0.03 0.05
Ridgeway/Crystal Beach HS	Fort Erie	Fieldhouse Lighting Retrofit	Jul-15 Jul-15	\$337 \$643	\$176 \$0	0.5	2,040	\$3,200.87 \$310.01	U.U5 Immediate
Gordon PS	Welland	Gym Lighting Retrofit	Aug-15	\$8,729	\$8,729	0.6	1,322	\$181.07	48.21
Richmond St. PS	Thorold	Gym Lighting Retrofit	Aug-15	\$14,973	\$12,013	7.4	16,986	\$3,279.18	5.54
Ridgeway/Crystal Beach HS	Fort Erie	Theatre Lighting Retrofit	Aug-15	\$6,439	\$3,655	14.5	5,220	\$1,670.44	5.26
AN Myer SS	Niagara Falls	Theatre Lighting Retrofit	Aug-15	\$8,225	\$4,807	8.5	6,408	\$1,644.93	6.07
Pine Grove PS	St. Catharines	Energy Audit	Sep-15	\$3,823	\$1,912	-	-	\$0.00 \$0.00	-
Burleigh Hill PS Park PS	St. Catharines Grimsby	Energy Audit Energy Audit	Sep-15 Sep-15	\$3,208 \$3,208	\$1,604 \$1,604	-	- -	\$0.00	- -
Peace Bridge PS	Fort Erie	Energy Audit	Sep-15	\$3,823	\$1,912	-	-	\$0.00	-
Valley Way PS	Niagara Falls	Energy Audit	Sep-15	\$3,208	\$1,604	-	-	\$0.00	-
McKay PS	Port Colborne	Interior Lighting Retrofit	Nov-15	\$2,527	\$2,311	0.4	1,074	\$157.72	23.05
Port Weller PS	St. Catharines	Interior Lighting Retrofit	Nov-15	\$895	\$895	0.1	853	\$116.83	7.66
Centennial SS	Welland	Energy Audit	Nov-15	\$0 \$0	\$0 \$0	-	-	\$0.00	-
St. Catharines Service Centre Education Centre	St. Catharines St. Catharines	Warehouse LED Retrofit Boardroom sign controls	Nov-15 Jan-16	\$0 \$17	\$0 \$17	3.3 0.0	10,782 199	\$1,476.87 \$24.73	Immediate 0.69
Sir Winston Churchill SS	St. Catharines	Auditorium Lighting Retrofit	Mar-16	\$17 \$4,147	\$3,107	2.6	4,059	\$708.27	4.39
Grimsby SS	Grimsby	Shop Lighting T12 Removal	Mar-16	\$4,527	\$4,527	10.3	24,881	\$941.58	4.81
EL Crossley SS	Pelham	Outdoor Lighting Retrofit	Apr-16	\$16,335	\$12,447	0.0	25,914	\$3,306.63	3.76
Education Centre	St. Catharines	Outdoor Lighting Retrofit	Apr-16	\$14,760	\$11,796	0.0	19,716	\$2,434.93	4.84
Edith Cavell PS	St. Catharines	Energy Audit	Apr-16	\$4,480	\$2,240	-	-	\$0.00	-
Grapeview PS	St. Catharines	Energy Audit	Apr-16	\$5,110 \$4.158	\$2,555	-	<del>-</del>	\$0.00 \$0.00	-
Parnall PS Port Weller PS	St. Catharines St. Catharines	Energy Audit Energy Audit	Apr-16 Apr-16	\$4,158 \$3,818	\$2,079 \$1,909	-	- -	\$0.00 \$0.00	- -
Westdale PS	St. Catharines	Energy Audit	Apr-16	\$4,480	\$2,240	- -	- -	\$0.00	- -
Laura Secord SS	St. Catharines	Theatre Lighting Retrofit	Apr-16	\$1,360	\$409	2.8	7,346	\$1,132.55	0.36
Princess Margaret PS	Niagara Falls	T12 Removal	Apr-16	\$112	\$112	0.5	1,093	\$43.04	2.60
EL Crossley SS	Wainfleet	T12 Removal	May-16	\$4,458	\$4,458	1.4	3,279	\$172.68	25.82
Ross PS	Welland	T12 Removal	May-16	\$5,360	\$5,360	3.4	8,270	\$449.08	11.94
Plymouth PS W.E. Brown PS	Welland Wainfleet	T12 Removal T12 Removal	May-16 May-16	\$6,297 \$897	\$6,297 \$897	10.1 1.5	24,511 3,707	\$1,278.03 \$267.02	4.93 3.36
Education Centre	St. Catharines	Boardroom Lighting Retrofit	Jun-16	\$2,159	\$2,159	1.5 17.5	17,450	\$1,551.36	1.39
EL Crossley SS	Wainfleet	T12 Removal	Jun-16	\$4,458	\$4,458	3.5	9,244	\$839.66	5.31
Jeanne Sauve PS	St. Catharines	Outdoor Lighting Retrofit	Aug-16	\$12,308	\$10,588	0.0	19,446	\$2,401.58	4.41
Quaker Rd. PS	Welland	Interior Lighting Retrofit	Aug-16	\$35,030	\$35,030	6.7	16,111	\$2,064.82	16.97
Governor Simcoe SS	St. Catharines	Gym Lighting Retrofit	Aug-16	\$18,306	\$16,626	4.1	13,121	\$1,946.83	8.54
St. Catharines Collegiate	St. Catharines	Gym Lighting Retrofit	Aug-16	\$61,020	\$55,820	13.1	72,727	\$10,024.68	5.57
Pine Grove PS Cherrywood Acres PS	St. Catharines Niagara Falls	Gym Lighting Retrofit Gym Lighting Retrofit	Aug-16 Aug-16	\$19,712 \$13,058	\$18,952 \$11,757	1.3 1.2	3,172 3,206	\$399.58 \$416.14	47.43 28.25
Jeanne Sauve PS	St. Catharines	Gym Lighting Retrofit	Aug-16	\$64,830	\$60,990	10.0	26,707	\$4,091.21	14.91
Princess Elizabeth PS	Welland	Interior Lighting Retrofit	Aug-16	\$26,484	\$20,321	14.1	15,372	\$2,105.44	9.65
Senator Gibson PS	Lincoln	Outdoor Lighting Retrofit - Phase 2	Aug-16	\$7,626	\$7,172	0.0	8,801	\$1,086.92	6.60
Lakeview PS	Grimsby	Outdoor Lighting Retrofit - Phase 2	Aug-16	\$9,153	\$8,210	0.0	8,251	\$1,099.03	7.47
Centennial SS	Welland	T12 Removal	Aug-16	\$11,294	\$11,294	3.4	8,270	\$518.47 \$1.470.13	21.78
Pine Grove PS W.E. Brown PS	St. Catharines Wainfleet	T12 Removal Library Lighting Retrofit	Aug-16 Aug-16	\$7,299 \$13,048	\$7,299 \$13,048	11.0 6.8	26,545 16,334	\$1,179.13 \$1,392.44	6.19 9.37
Ferndale PS	St. Catharines	Outdoor Lighting Retrofit - Phase 2	Sep-16	\$13,648	\$10,927	0.0	13,531	\$1,263.03	8.65
Steele St PS	Port Colborne	T12 Removal	Dec-16	\$0	\$4,332	0.6	1,560	\$237.01	18.28
St. Catharines Service Centre	St. Catharines	Complete LED Retrofit	Feb-17	\$34,359	\$31,081	12.3	31,079	\$4,257.06	7.30
Pine Grove PS	St. Catharines	Interior Lighting Retrofit - T8 LED Lamps	Mar-17	\$10,473	\$7,283	11.1	26,719	\$4,142.85	1.76
Peace Bridge PS	Fort Erie	Interior Lighting Retrofit - T8 LED Lamps	Mar-17	\$11,189	\$7,259	12.2	29,504	\$5,242.92	1.38
Grand Ave. PS	Grimsby	Interior Lighting Retrofit - T8 LED Lamps	Mar-17	\$14,670 \$13,601	\$9,534 \$9,001	13.7 14.1	33,000 34,007	\$5,691.69 \$5,864.74	1.68
Lakeview PS Stevensville PS	Grimsby Fort Erie	Interior Lighting Retrofit - T8 LED Lamps T12 Removal	Mar-17 Mar-17	\$13,601 \$15,153	\$9,001 \$15,153	14.1 5.5	13,361	\$5,864.74 \$1,080.17	1.53 14.03
Welland Service Centre	Welland	Complete LED Retrofit	Mar-17	\$13,560	\$10,737	9.0	22,658	\$3,103.36	3.46
Grand Ave. PS	Grimsby	Library Lighting Retrofit	Mar-17	\$3,915	\$3,915	2.9	7,000	\$1,217.38	3.22
Grand Ave. PS	Grimsby	Interior Lighting Retrofit - Lobby	Apr-17	\$466	\$466	0.3	653	\$36.07	12.92
Prince Philip PS (NF)	Niagara Falls	Interior Lighting Retrofit - Stage	Apr-17	\$92	\$92	0.8	1,872	\$147.81	0.62
AN Myer SS	Niagara Falls	Gym Lighting Retrofit	Aug-17	\$46,160	\$42,760	7.9	36,401 45, 138	\$5,284.73	8.09
Stamford Collegiate SS EL Crossley SS	Niagara Falls Wainfleet	Gym Lighting Retrofit Gym Lighting Retrofit	Aug-17 Aug-17	\$45,160 \$60,908	\$42,040 \$56,268	7.2 11.0	45,138 61,965	\$6,293.82 \$10,375.49	6.68 5.42
Westlane SS	Niagara Falls	Gym Lighting Retrofit  Gym Lighting Retrofit	Aug-17 Aug-17	\$58,309	\$50,268 \$52,989	12.7	67,346	\$10,375.49 \$9,585.96	5.53
225 35	- 6 2 - 2110	-,	<b></b>	, -,	1/		- /		

Richmond St. PS	Thorold	Interior Lighting Retrofit	Aug-17	\$102,500	\$94,796	29.1	87,007	\$15,472.54	6.13
DSBN Academy	St. Catharines	Gym Lighting Retrofit	Aug-17	\$29,885	\$28,515	6.7	24,995	\$3,620.27	7.88
Laura Secord SS	St. Catharines	Gym Lighting Retrofit	Aug-17	\$28,400	\$25,840	6.5	31,262	\$4,378.32	5.90
Sir Winston Churchill SS	St. Catharines	Gym Lighting Retrofit	Aug-17	\$28,900	\$26,392	5.6	28,619	\$3,980.26	6.63
Thorold SS	Thorold	Gym Lighting Retrofit	Aug-17	\$49,681	\$45,041	7.3	33,431	\$5,316.71	8.47
Quaker Rd. PS	Welland	Interior Lighting Retrofit - Kindergarten	Aug-17	\$646	\$646	0.9	2,058	\$151.26	4.27
Eastdale SS	Welland	Interior Lighting Retrofit - Phase 2	Sep-17	\$440,483	\$395,168	88.5	352,184	\$50,904.51	7.76
Applewood PS	St. Catharines	Summer Cooling Scheduling	Sep-17	\$0	\$0	0.0	2,477	\$912.55	0.00
Governor Simcoe SS	St. Catharines	Summer Cooling Scheduling	Sep-17	\$0	\$0	118.7	133,124	\$17,833.26	0.00
Jeanne Sauve PS	St. Catharines	Summer Cooling Scheduling	Sep-17	\$0	\$0	33.9	30,880	\$4,221.16	0.00
Laura Secord SS	St. Catharines	Summer Cooling Scheduling	Sep-17	\$0	\$0	19.4	6,481	\$920.03	0.00
Sir Winston Churchill SS	St. Catharines	Summer Cooling Scheduling	Sep-17	\$0	\$0	65.6	48,222	\$6,760.13	0.00
Carleton PS	St. Catharines	Timeclock Retrofit	Nov-17	\$0	\$3,417	-	22,127	\$3,111.92	1.10
Gracefield PS	St. Catharines	Administrative Lighting Retrofit	Jan-18	\$593	\$593	0.2	574	\$80.69	7.35
John Marshall PS	Niagara Falls	Interior Lighting Retrofit - T8 LED Lamps	Mar-18	\$6,541	\$2,326	8.4	38,727	\$5,571.93	0.42
Victoria PS	Niagara Falls	Interior Lighting Retrofit - T8 LED Lamps	Mar-18	\$4,240	\$1,670	5.1	23,613	\$3,481.27	0.48
Oakwood PS	Port Colborne	Interior Lighting Retrofit - T8 LED Lamps	Mar-18	\$1,089	\$429	1.3	6,064	\$977.10	0.44
Crossroads PS	NOTL	Interior Lighting Retrofit - T8 LED Lamps	Mar-18	\$11,420	\$5,145	11.6	53,474	\$7,312.04	0.70
William H Merritt PS	St. Catharines	Interior Lighting Retrofit - T8 LED Lamps	Mar-18	\$6,888	\$2,713	8.4	38,360	\$5,394.90	0.50
Thorold SS	Thorold	Shop Lighting Retrofit	Mar-18	\$6,193	\$5,285	1.4	4,578	\$901.03	5.87
Walker Living Campus	NOTL	Interior + Exterior Lighting Retrofit	Mar-18	\$1,671	\$1,109	5.2	16,973	\$2,408.90	0.46
EL Crossley SS	Wainfleet	Interior Lighting Retrofit	Jul-18	\$43,934	\$41,858	14.9	47,948	\$9,462.21	4.42
Orchard Park PS	Niagara Falls	Library Lighting Retrofit	Aug-18	\$0	\$1,382	1.6	3,961	\$646.58	2.14
Port Colbourne HS	Port Colborne	Shop Lighting Retrofit	Aug-18	\$9,492	\$9,492	14.4	45,778	\$7,672.34	1.24

Conservation Measures Cost	Demand Savings Total for Period (kW)	Energy Savings Total for Period (kWh)	Conservation Measures Annual Savings	Simple Payback (years)
\$1,422,798.36	927.3	2,175,214	\$304,928.37	4.7

Savings (kgCO2e) 87,009

2015 National Inventory Report Update

Natural Gas 1 m3 = 0.0373 GJ

1 m3 = 0.0373 GJ 1 GJ = 52 kg CO2

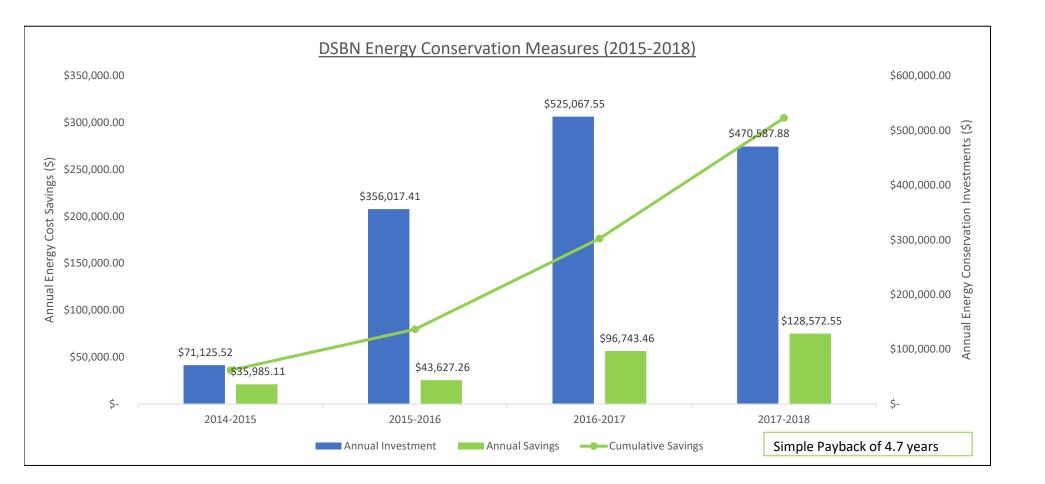
Electricity

1 kWh = 0.04 kg CO2e

		Invest	Investment		Savings		ative Savings	
FY13	2012-2013							
FY14	2013-2014					\$	-	
FY15	2014-2015	\$	71,125.52	\$	35,985.11	\$	35,985.11	
FY16	2015-2016	\$	356,017.41	\$	43,627.26	\$	79,612.37	
FY17	2016-2017	\$	525,067.55	\$	96,743.46	\$	176,355.82	
FY18	2017-2018	\$	470,587.88	\$	128,572.55	\$	304,928.37	

1,422,798.36 \$ 304,928.37

TOTAL



4.7 simple payback

# Appendix IV: Calculating Energy Conservation Goals – Fiscal Year 2018/2019 to Fiscal Year 2022/2023

#### Design, Construction and Retrofit Strategies

			2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023	1		
Lighting	Quantity of Time that Measure will be in place (years)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Saving (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)	Energy Payback Period	% related to Electricity	% related to Natu Gas
Efficiency Lighting Systems	15	\$ 381,490	348,680	\$ 965,000	882,003	\$ 225,000	205,648	\$ .		\$ .		5,888,357	7	100	0
tdoor Lighting	15	\$ .		\$ 55,000	50,270	\$ 100,000	91,399	\$ -		\$ .		475,276	7	100	0
ocupancy Sensors	10	\$ ·		\$ .	· ·	\$ .		\$ -		\$ .			5	100	0
Other (Describe)		\$ .	•	\$ .	•	\$ ,	•	\$ -	•	\$ .		•	0		100
	Г		2018-2019		2019-2020		2020-2021	2021-2022 2022-2023			2022-2023	2018/2019-2022/2023			
H.V.A.C.	Quantity of Time that Measure will be in place	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)	Energy Payback Period	% related to Electricity	% related to Natu Gas
ficient Boilers (near condensing)	30	s .		s .		s .		s .		s .			15	5	95
h-efficiency Boilers (condensing)	15	\$ 1,275,000	4,125,611	\$ 615,000	1,990,001	\$ 540,000	1,747,318	\$ 190,000	614,797	\$ 190,000	614,797	35,674,402	10	5	95
h-efficiency Boiler Burners	10	\$ -		\$ .	•	\$ .		s -	•	\$ -			5	5	95
othermal	20	\$ ·		\$ .		\$ .		\$ ·		\$ .			35	100	0 80
at Recovery/Enthalpy Wheels	30 15	\$ ·		\$ .		\$ ·				\$ .			8 7.5	20 50	80 50
ergy Efficient HVAC systems	30	• .				\$ 1.400.000	206.713	• •		\$ 535,000	78.994	699.133	7.5	50	50
nergy Efficient Rooftop Units	15	\$ 60.000	22.148	\$ 1.600.000	590,608	\$ 1,400,000 \$ 300.000	206,713 110,739	\$ ·		\$	78,994	2.805.389	30	50	50
gh Efficiency Domestic Hot Water	15	\$ .		\$ .		\$ .		\$ .		\$ .			10	15	85
ficient Chillers and Controls	25	\$ -		s -		\$ -		s -		\$ -			100	100	0
gh-efficiency Motors	20	\$ .	•	\$ .	•	\$ .	•	\$ -	•	\$ .			10	100	0
-D	15	s -		s .		s -		s -		\$ -			5	75	25
mand Ventilation trance Heater Controls	10	\$ .		\$ .		\$ .	•	s -	•				5 5	50 50	50 50
estratification Fans	10	\$ .		\$ .		\$ .		s .		\$ .			7	100	0
her (Describe)		\$ -		\$ .		\$ .		s -		\$ .			0		100
	-														
			2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			1
Controls	Quantity of Time that Measure will be in place	Estimated Cost of Implementation	2018-2019 Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	2019-2020 Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	2020-2021 Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	2021-2022 Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	2022-2023 Estimated Annual Energy Savings from all projects (ekWh)	2018/2019-2022/2023 Estimated Total Accumulated Energy Savings (ekWh)	Energy Payback Period	% related to Electricity	% related to Nati
			Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects	Estimated Total Accumulated Energy Savings			
ilding Automation Systems - New	place		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects	Estimated Total Accumulated Energy Savings	Period	Electricity	Gas
uilding Automation Systems - New uilding Automation Systems - Upgrade sal-time energy data for operators to	place 10		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects		Estimated Annual Energy Savings from all projects	Estimated Total Accumulated Energy Savings	Period 15	Electricity 50	Gas 50
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oulding Automation Systems - New uilding Automation Systems - Upgrade eachtme energy data for postures to leady and disputate building toward tutage Harmonizers  Building Eayelope  Building Eayelope Blasming  Coreased Wall Insulation leave Roof leave Windows  Heave Windows  Heavelope  Building Devices  The Windows  Heavelope  Heave Windows  Heavelope  Heavelope	place   10   10   10   10   10   10   15   15	Implementation	Estimated Annual Energy Savings from all projects (paint)  2015-2019  Estimated Annual Energy Savings from all projects (paint)  77, 200  50,107  2015-2019  Estimated Annual Energy Savings from all projects (paint)	Implementation	Estimated Annual Energy Sovings from all projects (awarh)  2019-2020  Estimated Annual Energy Sovings from all projects (awarh)  108.828  20.044  108.632	Implementation	Estimated Annual Cinergy Studings from all projects (aWth)  2000-2021  Estimated Annual Energy Studings from all projects (aWth)  250-360 417:207 204-46	Implementation  S S S S S S S S S S S S S S S S S S	Estimated Annual Energy Sovings from all projects (away)  2001-0022  Estimated Annual Energy Sovings from all projects (away)  3001-0022  2001-0022	Implementation  S	Estimated Annual Energy Sovings from all projects (askin)	Estimated Total Accumulated Energy Savings (sWh)	Period  15  15  15  3  7  0  Energy Payback Period  80  40  200  80  10  20	Electricity	50 50 0 100 % related to Natu Gas 80 80 80 80

Keys	
colour: yellow	= Default value
colour: blue	= Calculated Value
\$0.156	= cost of 1 ekWh electricity
\$ 0.0243	= cost of 1 ekWh natural gas
0.0955	m <sup>3</sup> = 1 ekWh (as per NRCan
	conservantables
\$0.25	= cost of 1 m3 of natural gas

Operations and Maintenance Strategies	eadthrough the document.		2018-2019		0040 0000	2019-2020 2020-2021 2021-2022 2022-2023						2018/2019-2022/2023	1		
Operations and Maintenance Strategies	1		2018-2019		2019-2020		2020-2021		2021-2022			2018/2019-2022/2023			4
Policy and Planning	Quantity of Time that Measure will be in place (years)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)	Energy Payback Period	% related to Electricity	% related to Natural Gas
New School Design/Construction Guidelines and Specifications	5	s -	- s			s -		s .		s -			5	60	
Day and Night Temperature Guidelines for all Schools	10	s -	- \$			s -		s .		s -			5	20	
Nighttime Blackout of Sites - Interior	10	\$ -	- s			\$ -		\$ -		ş -			7	100	<u> </u>
Nighttime Blackout of Sites - Exterior	10	\$ 5,000	4,570 \$	5,000	4,570	\$ 5,000	4,570	\$ 5,000	4,570	\$ 5,000	4,570	68,549	7	100	<u> </u>
Procures Only Energy Star Certified Appliances	5	\$ 10,000	12,798 S	10,000	12,796	\$ 10,000	12,796	S 10,000	12,798	\$ 10,000	12,798		5	100	
Demand Ventilation (servicing)	3	\$ -	- s			\$ -		\$ -	· · · · · · · · · · · · · · · · · · ·	ş -	the second secon		5	50	5
HVAC Optimization (coil cleaning, re-calibration of equipment)	3	\$ 50,000	276,848 \$	50,000	276,848	s -				s -			2	50	5
Commissioning (retro and re)	10	\$ 75,000	83,054 S	75,000	83,054	\$ .	•	s .		s .	The second secon	747,489	10	50	
Other (Describe)		s -	- s		•	s -	•	\$ -		s -	and the second s		0		19
-															
			2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
Energy Audits	Quantity of Time that Measure will be in place	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)	Energy Payback Period	% related to Electricity	% related to Natural Gas
Walk Through Audit	5	\$ 20,941	232 \$			\$ .		\$ .		s .		1,159	1000	50	50
Engineering Audit Other (Describe)	5	\$ -	- 5			\$ -				\$ .			1000	50	50
Const (Describe)	+	•				•		• .	-	•			3		100
			2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
Operations and Maintenance Strategies	Quantity of Time that Measure will be in place	Estimated Cost of	Estimated Annual Energy Savings from all projects	Estimated Cost of	Estimated Annual Energy Savings from all projects	Estimated Cost of	Estimated Annual Energy Savings from all projects	Estimated Cost of	Estimated Annual Energy Savings from all projects	Estimated Cost of	Estimated Annual Energy Savings from all projects	Estimated Total Accumulated Energy Savings			

Keys	
\$0.156	= cost of 1 ekWh electricity
\$0.0243 0.0955	= cost of 1 ekWh natural gas m³ = 1 ekWh
\$0.25	= cost of 1 m³ of natural gas

#### Press TAB to move to input area. Press UP or DOWN ARROW in column A to read through the document.

#### Occupant Behaviour Strategies

			2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
Training and Education	Quantity of Time that Measure will be in place (years)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from al projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)	Energy Payback Period	% related to Electricity	% related to Natural Gas
Building Operator Training	3	s -	-	\$ -		\$ -		\$ -		s -			3	60	40
Energy Benchmarking Program	5	\$ 10,000	111	\$ 10,000	111	\$ 10,000	111	\$ 10,000	111	\$ 10,000	111	1,661	1000	50	50
Building Automation Training (site specific)	3	s -	-	\$ -	-	\$ -	-	s -		s -			1	60	40
Ongoing Training and Awareness Programs for Energy Conservation	5	s -	•	s -	•	s -	-	s -	•	s -			10	90	10
Detailed Information on Building Operational Costs	1	s -	-	\$ -	-	\$ -	-	s -	-	s -			1000	50	50
Detailed Information on Energy Consumption (e.g. via the Utility Consumption Database or other database)	1	s -	-	s -		s -	-	s -		s -			1000	50	50
Participate in Environmental Programs, such as EcoSchools, Earthcare	1	s -		s -		ş -		\$ -		s -			5	90	10
Other Tools (Define)		s -	-	\$ -		\$ -		\$ -		s -			0		100
Occupant Behaviour Strategies Total		\$ 10,000	111	\$ 10,000		\$ 10,000		\$ 10,000		\$ 10,000	111	1,661			

Keys	
\$0.156	= cost of 1 ekWh electricity
\$0.0243	= cost of 1 ekWh natural gas
0.0955	m³ = 1 ekWh
\$0.25	= cost of 1 m³ of natural gas

End of worksheet.

Press TAB to move to input area. Press UP or DOWN ARROW in column A to read through the document.

#### Conservation Goal

Conservation Goal	FY 2018	1
Total Building Area (includes portables) (m²)		Enter from UCD use square meters
Total Building Area (includes portables) (ft²)	6,152,350	Enter from UCD - use square feet
Energy Consumption for the board (ekWh)	110,867,600	Enter from UCD

1 ft<sup>2</sup> = 0.0929 m<sup>2</sup>

	2018-2019			2019-2020		2020-2021		2021-2022	2022-2023		2018/2019-2022/2023
	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)
Appendix B: Design, Construction and Retrofit Strategies Total	\$ 4,661,490	4,890,393	\$ 5,330,000	3,830,906	\$ 6,880,000	3,072,563	\$ 1,305,000	835,688	\$ 1,275,000	829,382	51,494,035
Appendix C: Operations and Maintenance Strategies Total	\$ 160,941	377,500	\$ 140,000	377,268	\$ 15,000	17,366	\$ 15,000	17,366	\$ 15,000	17,366	3,500,765
Appendix D: Occupant Behaviour Strategies Total	\$ 10,000		\$ 10,000		\$ 10,000		\$ 10,000		\$ 10,000		1,661
TOTAL	\$ 4,832,431	5,268,004	\$ 5,480,000	4,208,284	\$ 6,905,000	3,090,040	\$ 1,330,000	853,164	\$ 1,300,000	846,859	54,996,461
Percentage reduction		4.75		3.80		2.79		0.77		0.76	12.8
Conservation Goal (ekWh/m²)		1.80		1.80		1.80		1.80		1.80	9.0
Conservation Goal (ekWh/ft²)		0.17		0.17		0.17		0.17		0.17	0.8
	Note		Note		Note	Ī	Note		Note		
	Check the total in cell B15 to confirm validity of estimated amount to be spent during that year		Check the total in cell D15 to confirm validity of estimated amount to be spent during that year		Check the total in cell F15 to confirm validity of estimated amount to be spent during that year		Check the total in cell H15 to confirm validity of estimated amount to be spent during that year		Check the total in cell J15 to confirm validity of estimated amount to be spent during that year		

End of worksheet.